

## Discovery of the Black-nest Swiftlet *Collocalia (Aerodramus) maxima* Hume in Vietnam and preliminary observations on its biology

by Phach NGUYEN QUANG

**Abstract.** — During the years 1981-1994, Black-nest Swiftlets *Collocalia maxima* were found breeding in small numbers (65 nests in 1994) for the first time in Vietnam. The nests were scattered among the much more numerous nests of the White-nest Swiftlet *Collocalia fuciphaga germani* in caves in islands along the coast of the Khanh Hoa province. In Vietnam, *C. maxima* has a diet constituted by 80 % Hymenoptera. It starts breeding about two weeks earlier than *C. fuciphaga*, but its young leave the nests at about the same time as the ones of this species. Breeding production is higher in *C. maxima* than in *M. fuciphaga* (0.75 vs 0.4-0.6 fledglings/pair/year), but population growth is slower. *C. maxima* continues nest-building during incubation, and there are almost no differences between first nests and nests built after the first ones have been harvested. In Vietnam, contrary to adjacent regions of South-east Asia, there is a distinct seasonality in nesting and moulting cycles of *C. maxima*.

**Key-words.** — *Aves*, Apodiformes, *Collocalia*, breeding, food, moult, Vietnam.

### Découverte de la Salangane à nid noir *Collocalia maxima* Hume au Vietnam et observations préliminaires sur sa biologie

**Résumé.** — Pendant les années 1981-1994, un petit nombre (65 en 1994) de nids de Salangane à nid noir *Collocalia maxima* Hume ont été découverts parmi ceux, bien plus nombreux, de la Salangane à nid blanc *Collocalia fuciphaga germani* Oustalet dans des grottes sur des îles au large de la côte du Khanh Hoa. C'est la première fois que *C. maxima* est trouvé au Vietnam, où sa nourriture se compose à plus de 80 % d'Hyménoptères. Cette salangane commence la construction de son nid au début de décembre et pond au début d'avril, soit avec environ deux semaines d'avance sur la Salangane à nid blanc. Toutefois, les jeunes des deux espèces quittent le nid à peu près en même temps. En l'absence de dérangements, environ 75 % des couples de *C. maxima* effectuent une seconde couvée. La production (0,75 jeune à l'envol par couple et par an) est plus élevée, mais la population croît plus lentement que chez *C. fuciphaga*. Au Vietnam toujours, et contrairement à sa congénère, la Salangane à nid noir continue à construire son nid pendant l'incubation, et il n'y a guère de différence de taille entre les premiers nids et ceux qui sont reconstruits après une récolte. Enfin, la Salangane à nid noir possède, au Vietnam, une saison de reproduction et une saison de mue bien définies, contrairement à ses populations vivant sous des latitudes plus méridionales.

**Mots-clés.** — *Aves*, Apodiformes, *Collocalia*, reproduction, nourriture, mue, Vietnam.

**Tóm tắt.** Một số đặc trưng phân bố, số lượng và sinh học của yến tổ đen (*Collocalia maxima* Hume) lần đầu tiên được tìm thấy tại Việt Nam đã được chỉ ra : loài yến này ở Việt Nam chỉ làm tổ ở các đảo yến Khánh Hòa (12°N-12° 20' N) với số lượng khoảng 65 tổ. Số lượng yến tổ đen tăng rất chậm (15 đôi trong khoảng 14 năm). Yến tổ đen ăn chủ yếu Hymenoptera (83%) và Hemiptera (8.7%), bắt đầu làm tổ vào đầu tháng 12, đẻ trứng vào đầu tháng 04 với một trứng. Tỷ lệ đẻ lứa đầu là 87,5% và lứa sau là 75%. Toàn bộ số trứng đẻ ra của hai lứa đều nở được và cho con non rời tổ bình thường. Tỷ lệ này cao hơn so với chim yến tổ trắng cùng nơi làm tổ. Chim non ở tổ 53 ngày. Bọn này thay lông có lẽ từ tháng 06 đến tháng 10.

## INTRODUCTION

During the course of my field work in swiftlet caves in Vietnam (1981-1994), I found each year a small number of “black” nests, consisting of black feathers mingled with the bird’s dried saliva. They were interspersed among the much more numerous “white” nests of pure dried saliva of the White-nest Swiftlet *Collocalia fuciphaga germani* Oustalet. Due to inadequate information, I identified the birds that built these nests as Hume’s Swiftlets *Collocalia brevirostris innominata* Hume (NGUYEN QUANG 1991), but, on the basis of more comprehensive material, it is now clear that these “black nests” belong to some subspecies of the Black-nest Swiftlet *Collocalia maxima* Hume, which is thus found for the first time in Vietnam.

The goal of this paper is to provide some information on the habitat and biology of this species which is new for the Vietnamese avifauna.

## MATERIAL AND METHODS

Since 1981, investigations have been carried out on islands all along the coast of Vietnam in order to determine the distribution of breeding swiftlets. Biological research was concentrated on swiftlet islands off the coast of Khanh Hoa. Fifteen specimens of Black-nest Swiftlet *Collocalia maxima* were collected on the islands of Nôi and Ngoai (Khanh Hoa, 12°N) in August 1994 and were measured immediately after having been caught. Their stomach contents were preserved for subsequent analysis of their food items. Nest-building was studied on eight nests on Nôi Island with NGUYEN QUANG’s (1992) method, by measuring the length of the nest base (Fig. 3, D), the length of the nest edge (Fig. 3, R) and the thickness of the nest at the place where the eggs are laid (Fig. 3, H). Careful observations were made to determine when the eggs are laid or hatch, and when fledglings leave the nests. Breeding efficiency has been calculated according to ODUM’s (1971) method: for egg-laying, the number of eggs effectively laid is divided by the theoretical number which could be laid in optimal physiological and environmental conditions and multiplied by 100; for hatching, the number of eggs effectively hatched is divided

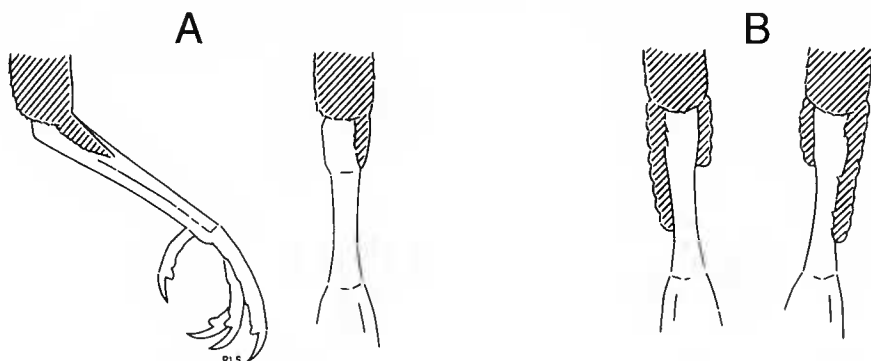


FIG. 1. — Legs of White-nest Swiftlet *Collocalia fuciphaga germani* (A) compared with legs of Black-nest Swiftlets *Collocalia maxima* (B), showing the feathering of the tarsi (after specimens from Vietnam).

by the theoretical number of eggs laid. It should be noticed that Black-nest Swiftlets lay only one egg per nest. These observations were carried out each year in spring from 1 January to 30 April, and in summer from 16 June to 28 August.

## RESULTS

### MORPHOLOGY OF THE BIRDS

Top of the head, wings and tail pure black, back brownish-black, abdomen a little paler, a wide band of paler feathers with dark shafts from thigh to thigh over the rump. Downy bases of mantle and rump feathers dark, with a small white dot at the top of the downy area. Tail not deeply forked. A row of 6-7 small feathers along the outer side of the leg and another of 3-5 feathers along the inner side (Fig. 1). The dimensions of the 15 collected birds are presented in Table 1. Their body mass was on average  $22 \pm 1.256$  g, ranging from 21 to 23 g.

TABLE 1. — Measurements (in mm) of Black-nest Swiftlets *Collocalia maxima* in Vietnam (n = 8).

Dimension	mean	(min.-max.)	$\pm \sigma$	$\pm sd$	CV
Wing length	133.90	(130.0-135.0)	3.02	1.000	2.25
Longest tail feather	53.80	(51.5-56.0)	1.40	0.374	2.60
Shortest tail feather	49.30	(45.0-52.0)	2.29	0.570	4.64
Tarsus length	11.95	(10.0-12.0)	0.76	0.276	6.80
Culmen length	5.70	(5.0-6.5)	0.48	0.230	8.50

Notes:  $\sigma$ : standard deviation, sd: standard error, CV: coefficient of variation.

The black colour of the nests of this species is derived from the dried saliva mingled with black feathers from the owner.

### DISTRIBUTION OF *COLLOCALIA MAXIMA* IN VIETNAM

In Vietnam, the Black-nest Swiftlet breeds between about 12° and 12°20'N on the islands of Ngoai, Nôi, Tre, Mun, Hô and Cha La, off the coast of Khanh Hoa (Fig. 2). The total number of pairs was very low, about 65 in 1994, and most nests were found in Chu Tap cave, on Nôi Island (ca. 30 nests) and in Mai Nha cave, on Ngoai Island (23 nests).

TABLE 2. — Composition of the stomach contents of 15 Black-nest Swiftlet *Collocalia maxima* adults in Vietnam.

Food items	Numbers of whole preys	%
Hymenoptera	622	83
Hemiptera	65	9
Lepidoptera	32	4
Coleoptera	31	4
<b>Total</b>	<b>750</b>	<b>100</b>

# BIOLOGY

## Food

The analysis of stomach contents (Table 2) shows that the birds ate mostly Hymenoptera, represented by wild bees (Apidae) and flying ants (Formicidae). Other items provided only a small part of the total diet.

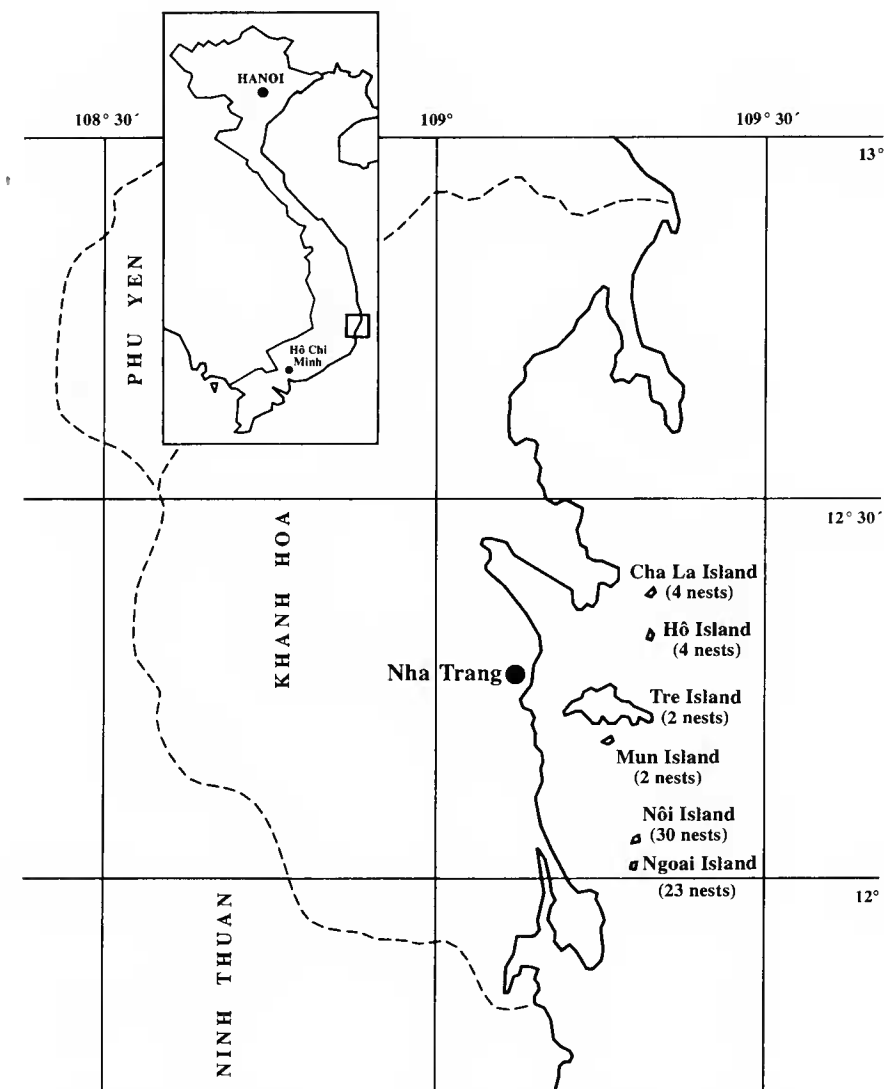


FIG. 2. — Breeding distribution of the Black-nest Swiftlet *Collocalia maxima* in Vietnam.

### Nest and nest-building

In Vietnam, Black-nest Swiftlets build their nests about fifteen days earlier than White-nest Swiftlets. Black-nest Swiftlets usually start nest-building in early December, whereas White-nest Swiftlets start in mid-December. If nests are collected continually, White-nest Swiftlets build new ones until June, but fail to do so later on. Black-nest Swiftlets, however, can rebuild new

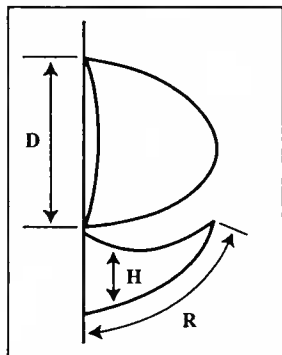
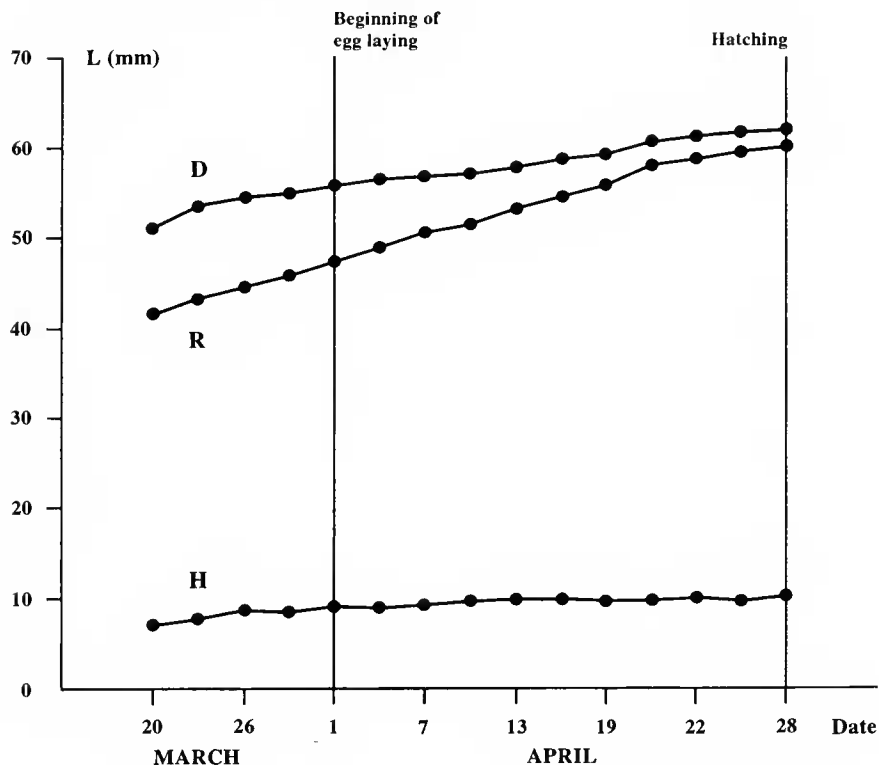


FIG. 3. — Growth of Black-nest Swiftlet *Collocalia maxima* nests during their building in Vietnam. L: value of D (length of nest base), of R (length of nest edge) and H (thickness of the nest at the place where the eggs are laid).



nests until September or October, even if they are then too small to allow successful breeding. Thus, it seems that in Vietnam Black-nests Swiftlets are able to build nests almost all year round.

The growth of the nests during their building is shown on figure 3. When the swiftlets start laying eggs, the thickness of the nest (Fig. 3, H) has almost reached its maximum size, whereas the nest base (Fig. 3, D) and the nest edge (Fig. 3, R) continue to increase until hatching. This mode of nest-building is very different from that of White-nest Swiftlets, in which the length of the nest edge is completed earlier, the growth of the nest base and thickness increase rapidly when the colony begins egg-laying and the nests almost reach their maximum size when 30-40 % of them in the colony have eggs (NGUYEN QUANG 1991, 1992).

The dimensions of the nest of the Black-nest Swiftlet in Vietnam are shown in Table 3. Contrary to what happens in several countries where swiftlets breed, in Vietnam nest-collectors pay little attention to Black-nest Swiftlets. Therefore the size of "natural nests" can be considered as their real size, without any influence from human beings, which may lead to size deviations. However, some Black-nest Swiftlet nests may also be taken during cropping of White-nest Swiftlet nests. In this case, the birds usually build again new ones, hence the name "re-built nests". There are almost no differences in size between natural and re-built nests, the lengths of the nest base (Table 3, D) and of the nest edge (Table 3, R) are similar, and the coefficient of variation (Table 3, CV) of the nest edge is lower in re-built nests than in natural nests (26.2 compared to 43.1, Table 3). In these respects the nests of Black-nest Swiftlets are similar to those of White-nest Swiftlets. The most important difference is that, in White-nest Swiftlets, R is always smaller than D, and shorter in re-built nests than in natural nests (NGUYEN QUANG 1991, 1992).

TABLE 3. — Measurements (in mm) of nests of Black-nest Swiftlets *Collocalia maxima* in Vietnam.

Nest type	measurements	min.-max.	mean	$\pm \sigma$	$\pm \text{sd}$	CV
Natural nests (N = 15)	D	40-75	63.7	10.5	1.22	16.5
	R	30-77	62.6	23.9	1.88	43.1
	H	3-10	6.3	2.5	0.58	9.7
Rebuilt nests (N = 15)	D	40-75	63.3	9.8	0.78	15.5
	R	30-75	61.2	16.0	0.97	26.2
	H	3-10	5.8	2.1	0.35	9.7

Notes:  $\sigma$ : standard deviation, sd: standard error, CV: coefficient of variation, D: length of the nest base, R: length of the nest edge, H: thickness of the nest at the place where the eggs are laid.

### *Breeding*

Detailed observations at 8 nests in 1994 show that Black-nest Swiftlets lay eggs in early April (Table 4). The clutch is of one egg per nest. Seven out of eight of these nests received an egg, which makes a breeding efficiency at egg-laying of 87.5 %. In the same cave, White-nest Swiftlets began to lay eggs between 15 and 18 April, about two weeks later than Black-nest Swiftlets. The seven Black-nest Swiftlet pairs under observation brooded eggs during 26-30 days, averaging nearly 29 days.

TABLE 4. — Egg-laying and hatching dates of Black-nest Swiftlet *Collocalia maxima* in Vietnam in 1994.

Nest	Dates of	
	egg-laying	hatching
1	—	—
2	2 April	2 May
3	1 April	30 May
4	2 April	28 May
5	1 April	2 May
6	3 April	29 May
7	1 April	29 May
8	5 April	(no data)

Under natural conditions, when the nests are not harvested, Black-nest Swiftlets in Vietnam have two clutches a year, the first starting in early April and the second beginning about 3-7 days after the fledglings of the first brood have left the nests. Of the eight nests under observation, seven received an egg at the first clutch, and only six at the second clutch. All eggs hatched and every fledgling left the nest. This corresponds to a breeding efficiency at egg-laying of 87.5 % for the first and 75.0 % for the second clutch (Table 5).

TABLE 5. — Breeding efficiency of the Black-nest Swiftlet *Collocalia maxima* in Vietnam in 1994.

Clutch	Number of nests	Number of eggs laid		Number of eggs hatched		Number of chicks fledged	
		n	%	n	%	n	%
First	8	7	87.5	7	87.5	7	87.5
Second	8	6	75.0	6	75.0	6	75.0

The only difference with White-nest Swiftlets is that 75 % of Black-nest Swiftlet pairs lay a second natural clutch, versus only 30 % of the White-nest Swiftlets. Theoretically, each pair of Black-nest Swiftlets can rear 1.63 young a year, but, because of nest exploitation, it rears only 0.75 young. This figure is apparently higher than for White-nest Swiftlets (0.4-0.6 young a year). It is surprising that, during the 14 years of continuous observation (1981-1994), the

TABLE 6. — Progress of wing quill moult in Black-nest Swiftlets *Collocalia maxima* in Vietnam in August 1994 (% of birds moulting or having just moulted their wing-quills) (n = 40).

Date (August)	Primaries										Secondaries					
	10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6
16-17	80	40	.	.	.	.	.	.	.	.	.	.	.	.	60	100
18-19	20	.	.	.	.	.	.	.	.	.	.	.	.	20	.	.
20-21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	.
22-23	8	.	20	.	.	.	.	.	.	.	.	.	.	20	.	.
24-25	.	20	.	.	.	.	.	.	.	.	.	.	20	20	.	.
26-27	.	40	20	40	.	.	.	.	.	.	.	.	.	.	.	.
28-29	.	.	60	40	100	100	100	100	100	100	100	100	80	40	20	.

number of Black-nest Swiftlets breeding in the area only increased by 15 pairs, while the White-nest Swiftlet population grew 10-15% per year during the same time, even if there are now signs of stabilization.

Black-nest Swiftlet chicks stay from 50 to 55 days (average: 53 days) in the nests, that is, about two weeks longer than White-nest Swiftlet chicks, which makes them leave their nests at about the same time than the latter.

### Moult

Table 6 shows that 100% of the Black-nest Swiftlets under study had moulted or were moulting their wing-quills during the sampling period (August 1994): primaries 1-6 and secondaries 1-2 had been completely moulted, primaries 7-10 and secondaries 3-6 were under moult. All Black-nest Swiftlets captured from January to May and in November had fully-grown flight feathers in good state, suggesting that in Vietnam they moult them only once a year. These results agree with the ones found in White-nest Swiftlets (NGUYEN QUANG 1994).

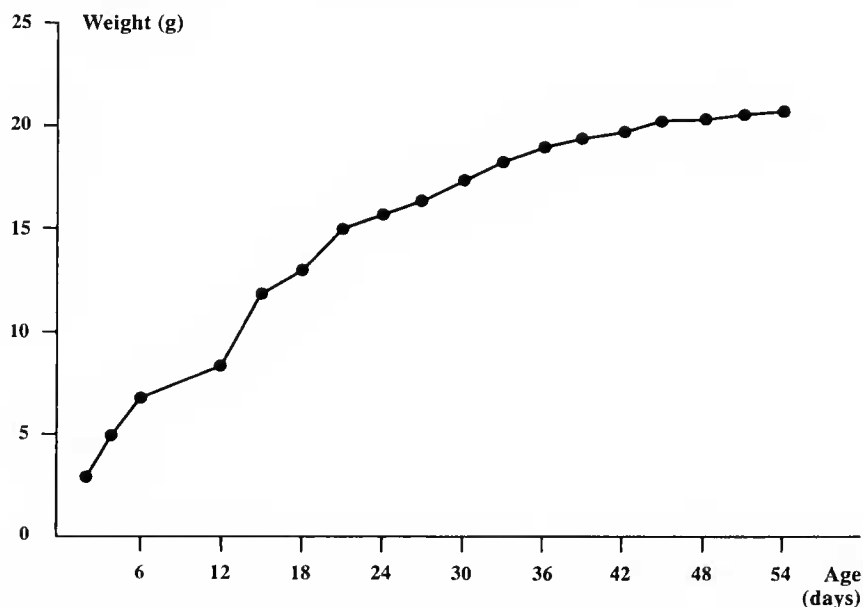


FIG. 4. — Growth in body mass (g) of seven Black-nest Swiftlet *Collocalia maxima* chicks in Vietnam in 1994.

## DISCUSSION

The fact that the birds with the “black” nests have tarsi with two rows of small feathers and that they build their nests with saliva mingled with body feathers characterize them as *Collocalia maxima* Hume [= *C. lowi* (Sharpe)], and differentiate them particularly from Hume’s Swiftlet *C. brevirostris*, which has unfeathered or slightly feathered tarsi and builds nests of grass (MEDWAY 1966). Hume’s Swiftlets have not been found in the coastal caves of Vietnam.



The Black-nest Swiftlet has not been previously recorded from Vietnam, from where it is not mentioned by DELACOUR & JABOUILLE (1931) nor VO QUY (1975).

STRESEMANN (1931), followed by PETERS (1940) and HOWARD & MOORE (1991), divided *C. maxima* into four subspecies:

— *C. m. tichelmani* Stresemann, 1926 (South-eastern Borneo);

— *C. m. lowi* (Sharpe, 1879) (North-western Borneo, Sumatra);

— *C. m. vulcanorum* Stresemann, 1926 (Java);

— *C. m. maxima* Hume, 1878 (= *robinsoni* Stresemann, 1931) (Tenasserim, Malaya, Gulf of Thailand, Mergui Archipelago).

MEDWAY (1962c, 1966) considered the taxon *vulcanorum* as not belonging to *maxima*, and linked it to *C. brevirostris* (Horsfield). The status of *palawanensis* Stresemann is still controversial, some authors considering it as belonging to *maxima*, others to *whiteheadi* Ogilvie-Grant.

According to their dimensions and distribution, the Vietnamese Black-nest Swiftlets belong to the nominate subspecies, *C. maxima maxima* Hume. However, our specimens have slightly longer tails than the ones measured by STRESEMANN (49.3-53.8 compared to 46.1-49.4 mm). Similarly, northern populations of White-nest Swiftlets have longer tails than the more southern ones (NGUYEN QUANG 1994).

HARRISON (1976) showed that the food of Black-nest Swiftlets in Borneo consisted mainly in Hymenoptera (72,5%), and Isoptera (Termites) (21,5%). Other foods provided only 6% of the total. This is similar to my observations in Vietnam.

In their quantitative study of swiftlets in Singapore, KANG *et al.* (1990) showed that Black-nest Swiftlets lay their eggs when the nests have reached their maximum weight, that is, when they have completed building them. By contrast, in Vietnam, Black-nest Swiftlets lay eggs before the nest edge (R) reaches its maximum length, and they continue building their nests until the time of hatching. This difference may be due to differences in methods of observation, or, more probably, to the fact that Black-nest Swiftlets in Vietnam breed seasonally, in a limited period of time, whereas they breed almost all year round in Borneo, like other *Collocalia* species in equatorial regions (MEDWAY 1962a, b; LANGHAM 1980).

MEDWAY (1962a) showed that Black-nest Swiftlets in Malaysia moult almost all year round, instead of having a well-defined moulting season as they do in Vietnam. The same is true of White-nest Swiftlets (NGUYEN QUANG 1994). These two species have clear-cut moulting and breeding seasons in the northern part of their range, where they can raise two broods a year under natural conditions.

### Acknowledgements

I thank Mrs J. BACKSTRÖM, Centre de Recherches sur la Biologie des Populations d'Oiseaux, MNHN, Paris, who corrected the English, M. P. SUIRO, Laboratoire des Mammifères et Oiseaux, MNHN, Paris, who drew the figures for this article, the Earl of CRANBROOK and Pr F. VUILLEUMIER, who made useful comments on the manuscript, as well as Dr J.-F. VOISIN, Laboratoire des Mammifères et Oiseaux, MNHN, Paris, who helped me in various ways.

## REFERENCES

- DELACOUR J. & JABOUILLE P., 1931. — *Les oiseaux de l'Indochine Française*, vol. I, Paris (no editor given).
- HARRISON T., 1976. — The food of *Collocalia* swiftlets (Aves, Apodidae) at Niah cave in Borneo. *J. Bombay Nat. Hist. Soc.* 7: 376-393.
- KANG N., NAILS C. J. & SIGURDSSON J. B., 1991. — Nest construction and egg-laying in Edible-nest Swiftlets *Aerodramus* spp., and the implications for harvesting. *Ibis* 133: 170-177.
- LANGHAM N., 1980. — The breeding biology of the Edible-nest Swiftlet *Aerodramus fuciphagus*. *Ibis* 122: 447-461.
- MEDWAY Lord, 1962a. — The swiftlets (*Collocalia*) of Niah cave, Sarawak, part 1: breeding biology. *Ibis* 104: 45-66.
- 1962b. — The swiftlets (*Collocalia*) of Niah cave, Sarawak, Part 2, ecology and the regulation of breeding. *Ibis* 104: 228-245.
- 1962c. — The relation between the reproduction cycle, moult and changes in the sublingual salivary gland of the swiftlet *Collocalia maxima* Hume. *Proc. Zool. Soc.*, London 138: 304-315.
- 1962d. — The swiftlets (*Collocalia*) of Java and their relationships. *J. Bombay Nat. Hist. Soc.* 59: 146-153.
- 1966. — Field characters as a guide to the specific relations of swiftlets. *Proc. Linn. Soc.*, London 177: 151-177.
- NGUYEN QUANG P., 1991. — [The genus *Collocalia* in Vietnam]. *Vien Khoa Hoc Việt Nam. Tap Chi Sinh Hoc* 10: 33-36 [in Vietnamese].
- 1992. — The breeding biology of the Edible-nest Swiftlet *Collocalia fuciphaga germani* Oustalet in Vietnam. *Oiseau et R. f. O.* 62: 149-161.
- 1994. — Breeding and moult in the Edible-nest Swiftlet *Collocalia fuciphaga germani* in Vietnam. *Alauda* 62: 107-115.
- STRESEMANN E. R., 1931. — Notes on the systematics and distribution of some swiftlets (*Collocalia*) of Malaysian and adjacent subregions. *Bull. Raffl. Mus.* 6: 55-101.
- VO Q., 1975. — [*Birds of Vietnam*], vol. I. Hanoi, Scient. Tech. House Press [in Vietnamese].